Section 4.10
# Water Quality

This section discusses the quality of surface water and groundwater in the study area. It includes information on UDOT de-icing practices and how these practices could affect water quality, as well as information on other contaminants of concern evaluated that were in the Final EIS. This section also presents new information on groundwater rights in the study area and a discussion of the newly designated drinking water source protection (DWSP) zones.

## 4.10.1 Approach and Methodology

### 4.10.1.1 Changes since June 2000 Final EIS

To update the affected environment and environmental consequences information associated with water quality in the study area, Sections 3.10 and 4.10 of the Final EIS were reviewed to determine what changes had taken place since publication of the Final EIS. The study area for water quality is described in Section 4.0.1, *Study Area*, of this document.

Recent research on how the operation of roadways affects water quality was reviewed to determine whether new information was available that would update or change any of the conclusions or methodology presented in the Final EIS.[1] Research on de-icing methods was included in this literature review, and UDOT was contacted to determine what de-icing practices are typically implemented in the State of Utah (Berhard pers. comm.). The most recent water quality regulations and Clean Water Act Section 303(d) list of impaired waters was obtained from the UDEQ (Utah Department of Environmental Quality 2004), and updated information on groundwater right locations in the study area was obtained from the UDNR Division of Water Rights (Utah Department of Natural Resources, Division of Water Rights 2004). UDEQ, Division of Water Quality, and UDEQ, Division of Drinking Water were also consulted regarding updated drinking water protection zones and potential changes to the Clean Water Act Section 401 Water Quality Certification for the proposed action (see Section 4.11, *Permits and Clearances*). The U.S. Environmental Protection Agency (EPA) STORET database, EPA's largest computerized environmental data system, was also reviewed for new water quality information on modeled waterways.

In addition, both the affected environment and environmental consequences sections of the Final EIS were reviewed to determine whether the decision to narrow the proposed right-of-way from 100 m (328 ft) to 95m (312 ft) would change information disclosed in the Final EIS specific to water quality (see Chapter 3, *Alternatives*).

[1] This research included review of 31 papers and reports in various scientific journals and records. See Chapter 8, *References*, of this document for specific references for this literature.

### 4.10.1.2 Changes since Draft Supplemental EIS

Changes have been made to the calculations of water quality impacts since the Draft Supplemental EIS was published in December 2004. Those changes were made for the following reasons.

- A correction was made to the tolerance level of domestic livestock and poultry to salinity. See Section 4.10.3.2, *Surface Water Quality*.

- As stated in Section 4.0, *Introduction*, additional minor modifications have been made to the alignments of Alternatives A and E (Final EIS Preferred Alternative) since preparation of the Draft Supplemental EIS. Where applicable, impact information presented in this Final Supplemental EIS has been updated to reflect those modifications. See Section 4.10.3.4, *Groundwater Rights and Wells*, Table 4.10-3.

- The number of groundwater rights and wells that would be located in the right-of-way of each build alternative has been updated, and the impact assessment revised as appropriate. See Table 4.10-3 in Section 4.10.3.4, *Groundwater Rights and Wells*.

## 4.10.2 Affected Environment

This section presents a summary of updated information on the affected environment relative to the quality of surface water and groundwater in the study area. Topics discussed include water quality regulations applicable in the study area, the quality of water in Great Salt Lake, the quality of surface water conveyances and groundwater, and groundwater rights and wellhead protection zones. This section also provides information on typical de-icing methods used by government agencies, and those specifically used by UDOT in the Salt Lake Valley. Updated information on the use of gray water and the biogeochemical function of wetlands is also provided in this section.

### 4.10.2.1 Water Quality Regulations

As stated in the Final EIS, water quality in the study area is regulated by the EPA, the Corps, and UDEQ under Sections 303, 401, 402, and 404 of the CWA. (See Section 4.11, *Permits and Clearances*, of this document for a more complete discussion of these regulations.) To meet CWA goals, the State of Utah has implemented the Utah Water Quality Act and classified surface waters in Utah into Beneficial Use Classifications (see Table 3-25 in the Final EIS). Each classification has an associated numerical or narrative standard, both of which are explained in detail in Section 3.10.1 and Table 3-26 in the Final EIS. One of UDEQ's goals is to ensure that projects like the Legacy Parkway project do not cause the quality of the receiving waters to degrade such that the numerical standards are exceeded.

None of the applicable water quality regulations mentioned above has changed since publication of the Final EIS, with the exception of the standards for metals and aquatic wildlife. These revised standards are discussed below in Section 4.10.3.2, *Surface Water Quality*.

### 4.10.2.2 Great Salt Lake Water Quality

As stated in the Final EIS, relative to water quality, Great Salt Lake is best known for its high salinity, which ranges from 9 to 28 percent, depending on location. Other water quality constituents in the lake include magnesium, potassium, calcium, chloride, and sulfate. Under the Utah Water Quality Act, UDEQ classifies Great Salt Lake as a Class 5 water, which means it is protected for primary and secondary contact recreation, aquatic wildlife, and mineral extraction.

### 4.10.2.3 Water Quality of Surface Conveyances

As stated in the Final EIS, each of the proposed build alternatives would cross numerous creeks and stream channels in the study area (see Figure 3-18 and Table 3-27 in the Final EIS). These rivers and creeks currently receive runoff from I-15, and were receiving runoff from I-15 at the time the Final EIS was published.

In April 2004, UDEQ updated its CWA Section 303(d) list of impaired waters to include portions of the Jordan River that are in the study area (Utah Department of Environmental Quality 2004). Specifically, the Jordan River from Farmington Bay upstream 9.8 km (6.1 mi) is now listed for low dissolved oxygen concentrations and high total dissolved solids (TDS). Figure 4.10-1, which updates Figure 3-18 in the Final EIS, shows the segment of the Jordan River that is impaired. This update to the impaired list means that the standards for beneficial use Classification 3C, nongame fish and other aquatic wildlife, and Classification 4, agricultural uses, in this portion of the Jordan River are not being met, and that UDEQ may limit discharges by Utah Pollutant Discharge Elimination System (UPDES) permit holders into this segment of the Jordan River that lower levels of dissolved oxygen (i.e., nutrients) or increase levels of TDS. This limitation would be based on a total maximum daily load (TMDL) analysis conducted by UDEQ and could apply to UPDES construction permits associated with construction projects, such as Legacy Parkway. UDEQ has not yet completed the TMDL for this portion of the Jordan River. The UDEQ report lists the Jordan River as low priority for further analysis.

No other changes to the surface water quality have occurred since publication of the Final EIS.

### 4.10.2.4 Groundwater Quality

As described in the Final EIS, a multilayered groundwater flow system underlies the study area. A shallow, unconfined (i.e., not under pressure) aquifer lies under the ground surface up to a depth of 3 m (10 ft). This shallow aquifer is recharged by precipitation, upward leakage from the principal aquifer, and river infiltration. It exhibits higher concentrations of dissolved solids, sodium, and chloride than does the principal aquifer.

The principal aquifer, which is typically located over 60 m (200 ft) below the ground surface, is separated from the shallow aquifer by a layer of fine-grained soil. It is a confined aquifer (i.e., under pressure) that is recharged through precipitation from the base of the Wasatch Mountains. As stated in the Final EIS, it is currently used for public supply and irrigation. The water quality of the principal aquifer varies with depth and location, but it is generally characterized by lower concentrations of dissolved solids than the shallow aquifer (i.e., generally less than 500 milligrams per liter) (Baskin et al. 2002).

No supplemental information or research has been collected to indicate that the groundwater quality in the study area has substantively changed since publication of the Final EIS.

### 4.10.2.5 Groundwater Rights

As described in the Final EIS, a number of private and municipal wells are located in the study area. The UDNR Division of Water Rights tracks groundwater rights according to an inventoried water right number. Each water right number represents one or more actual groundwater wells. Figure 4.10-2 illustrates the current location of existing private wells in the study area, both domestic and non-domestic (i.e., irrigation, stock watering, municipal, or recreational) (Utah Department of Natural Resources, Division of Water Rights 2004). Several of the wells in the study area are no longer in the footprint of the proposed build alternative alignments because of the narrowed right-of-way. Figure 4.10-2 updates Figure 3-20 in the Final EIS to reflect changes in well status since publication of the Final EIS.

At the time the Final EIS was published, UDEQ was responsible for establishing wellhead protection areas around municipal wells to protect public water supplies. UDEQ now refers to wellhead protection areas as drinking water source protection (DWSP) zones. UDEQ requires that owners of wells that are used to supply public drinking water (i.e., serve more than 25 people) prepare a DWSP plan (UAC R309-600). The plan must identify four distinct protection zones, each of which has different management requirements, as described below.

- Zone 1 is the area within a 30-m (100-ft) radius of the wellhead.
- Zone 2 is the area within a 250-day groundwater time of travel to the wellhead.
- Zone 3 is the area within a 3-year groundwater time of travel to the wellhead.
- Zone 4 is the area within a 15-year groundwater time of travel to the wellhead.

In general, development is not allowed within a designated DWSP zone unless the development is consistent with the DWSP plan. Figure 4.10-3 updates Figure 3-21 in the Final EIS to reflect designation of the new DWSP zones (Utah Department of Natural Resources, Division of Water Rights 2004). One DWSP zone (a Zone 4) illustrated on Figure 4.10-3 encroaches into the study area; this DWSP zone is associated with a well owned by the City of Woods Cross. DWSP zones associated with inactive wells were not analyzed in this document.

## 4.10.2.6 De-icing Operations

The following provides a brief discussion of typical de-icing methods employed by UDOT in the Salt Lake Valley, which includes Salt Lake and Davis Counties and encompasses the study area. Although de-icing operations were not described in detail in the Final EIS, this section is presented to provide additional information on what constituents could be introduced into surface and shallow groundwater systems in the study area if any of the proposed build alternatives were constructed. UDOT uses all the methods described below throughout the state to prevent ice from building up on roads.

### *Salt*

The application of granular salt (NaCL) to a roadway is the most widely used de-icing method. UDOT uses two main types of salt on roads: solar salt and Redmond Mineral salt. Solar salt is derived from evaporation beds, such as Great Salt Lake, and typically consists of over 99 percent sodium chloride. Redmond Mineral salt comes from an underground salt deposit near Redmond, Utah, and consists of approximately 93–98 percent sodium chloride, with the remainder attributed to trace minerals (Anderson pers. comm.). Both products contain anti-caking compounds according to UDOT specifications, which include small amounts of ferryl cyanide (50 parts per million) (Berhard pers. comm.).

With the exception of applying abrasives alone, all de-icing methods employ some form of salt. UDOT minimizes the use of salt to the extent possible for economic and environmental reasons (Berhard pers. comm.).

### *Abrasives (Sand)*

Abrasives can also be applied to a roadway as a de-icing method, although they have not been proven effective unless combined with salt. Studies suggest that at highway speeds, abrasives can be swept off the road after eight to 12 vehicle passes and that friction benefits are minimal (Nixon 2001). The use of abrasives can also degrade local air quality and can result in an accumulation of sand in gutters (Nixon 2002, Schlup and Ruess 2002).

UDOT avoids using abrasives in the Salt Lake Valley because, when airborne, they can contribute to particulate matter 10 microns in diameter or less (PM10) in the air and degrade local air quality (Berhard pers. comm.).

### *Abrasives and Salt*

Salt typically will not melt ice at cooler temperatures (e.g., below –9 degrees Celsius [15 degrees Fahrenheit]). Abrasives are therefore sometimes added to salt when temperatures are anticipated to be very low. As stated above, UDOT avoids the use of abrasives in the Salt Lake Valley because of air quality concerns.

### *Pre-wetting*

Pre-wetting refers to mixing liquid brine (e.g., salt water, typically magnesium chloride) at the spreading disk just before the salt is spread on the road. When the salt is wet, it binds more effectively to the roadway and is less likely to be blown off the road by passing vehicles. Pre-wetting increases the effectiveness of using salt as a de-icing method and reduces the overall quantity of salt required.

UDOT uses pre-wetting, as appropriate, throughout the state to prevent build up of ice on roads.

### *Anti-icing*

Anti-icing refers to spreading liquid brine before the snow and/or ice accumulate on the road. This method requires anticipating weather cycles, precipitation, and temperatures. If liquid brine is applied to a road and it doesn’t snow or freeze, or if it only rains, the liquid brine can actually make the road more slippery.

UDOT uses anti-icing, as appropriate, throughout the state to prevent ice build up on roads.

### *Temperature Monitoring*

All the methods described above have temperature ranges within which they are more effective. For this reason, it is important to know the temperature of the road surface before selecting a particular de-icing method. Monitoring road surface temperatures and weather forecasting and then selecting the proper de-icing method based on those conditions increases the effectiveness of the de-icing method and reduces the quantity of salt introduced into the environment.

UDOT uses state-of-the-art methods to monitor road temperatures, including snow removal trucks outfitted with built-in infrared temperature sensors to monitor road temperatures. In recent years, UDOT has reduced the annual salt usage in Salt Lake County from 100,000 tons per year to 80,000 tons per year by using these technologies (Berhard pers. comm.).

### 4.10.2.7 Use of Gray Water for Landscaping

During the design-build phase for the proposed action, UDOT disclosed that it was considering using treated wastewater (gray water) to maintain landscaping along the proposed build alternative alignments. Although gray water is treated adequately to be released into a receiving stream, it is not treated to drinking water standards. UDOT has not decided whether to use gray water to maintain landscaping in the project area, but the potential impacts associated with its use are described in Section 4.10.3.2 below.

### 4.10.2.8 Biogeochemistry of Wetlands

As described in the Final EIS, the biogeochemistry function of a wetland is related to water quality. Section 3.10.6 and Table 3-28 in the Final EIS describe how well wetlands in the study area are performing this function. Although some wetlands in the study area have been filled, the ability of the remaining wetlands to perform this function has not changed since publication of the Final EIS. See Section 4.12, *Wetlands*, of this document for additional information regarding wetlands in the study area.

## 4.10.3 Environmental Consequences and Mitigation Measures

As described in the Final EIS, implementation of any proposed build alternative could affect the quality of both surface water and groundwater. This section provides supplemental information documenting why certain contaminants were evaluated as contaminants of primary concern in both the Final EIS and this document. In addition, this section presents updated information on potential impacts on the quality of surface water and groundwater, as well as impacts on groundwater rights, including how the proposed action would affect DWSP zones in the study area.

### 4.10.3.1 Contaminants Evaluated

Section 4.10.1 in the Final EIS describes the typical contaminants found in highway runoff and the source of the contaminants. The source of the data in the table is FHWA Report, *Evaluation and Management of Highway Runoff Water Quality* (Federal Highway Administration 1996). Since publication of the Final EIS, the U.S. Geological Survey (USGS) published a report titled *The National Highway Data and Methodology Synthesis* that reviews the data and methodology of FHWA's highway runoff research (U.S. Geologic Survey 2003). The USGS report indicates that organic compounds, including semivolatile organic compounds (SVOCs) and volatile organic compounds (VOCs), such as petroleum hydrocarbons, oil, and grease, can also be present in highway runoff. The source of the organic compounds is generally crankcase oil and vehicle emissions.

Table 4.10-1 provides an update of Table 4-15 in the Final EIS to reflect these organic compounds and their sources.

**Table 4.10-1** Typical Highway Runoff Contaminants

| Contaminant | Source |
|---|---|
| Particulates | Pavement wear, vehicles, atmosphere, maintenance, snow/ice abrasives, sediment disturbance |
| Nitrogen, Phosphorous | Atmosphere, roadside fertilizer use, sediments |
| Lead | Leaded gasoline, tire wear, lubricating oil and grease, bearing wear, atmospheric fallout |
| Zinc | Tire wear, motor oil, grease |
| Iron | Auto body rust, steel highway structures, engine parts |
| Copper | Metal plating, bearing wear, engine parts, brake lining wear, fungicide and insecticide use |
| Cadmium | Tire wear, insecticide use |
| Chromium | Metal plating, engine parts, brake lining wear |
| Nickel | Diesel fuel and gasoline, lubricating oil, metal plating, brake lining wear, asphalt paving |
| Manganese | Engine parts |
| Bromide | Exhaust |
| Cyanide | Anticake compound used to keep de-icing salt granular |
| Sodium, Calcium | De-icing salts |
| Sulphate | Roadway beds, fuel, de-icing salts |
| Petroleum | Spills, leaks, blow-by motor lubricants, antifreeze, hydraulic fluids, asphalt surface leachate |
| PCBs, pesticides | Spraying of highway rights-of-way, atmospheric deposition, PCB catalyst in synthetic tires |
| Pathogenic bacteria | Soil litter, bird droppings, trucks hauling livestock/stockyard waste |
| Rubber | Tire wear |
| Asbestos | Clutch and brake lining wear |
| Organic compounds | Crankcase oil and vehicle emission (U.S. Geological Survey 2003) |

Source: Federal Highway Administration 1996, except as noted in table.

The Final EIS states that the primary contaminants of concern in the study area are TDS, metals, chlorides, and total suspended solids (TSS). Although these contaminants are not the only contaminants present in highway runoff, they were determined to be the primary contaminants of concern based on the existing water quality of the streams that would receive runoff from the proposed highway, the potential of these contaminants to affect aquatic wildlife, and the fact that they are the most common contaminants found in highway runoff in Utah. As stated in the Final EIS, identification of the contaminants of concern was completed through consultations with the Corps, UDEQ, and UDOT.

Bill Moellmer, a water quality management scientist with UDEQ, Division of Water Quality, was contacted in November 2003 to verify that the primary contaminants of concern identified in the Final EIS were appropriate for evaluation in the Supplemental EIS. Mr. Moellmer reviewed the relevant section of the Final EIS and stated that the list of primary contaminants of concern and the analysis of the water quality impacts in the Final EIS were valid for evaluating the proposed action in the Supplemental EIS (Moellmer pers. comm.).

## 4.10.3.2 Surface Water Quality

### *No-Build Alternative*

#### Existing Conditions (2004)

No project-related impacts on surface water quality would occur under the existing conditions (2004) No-Build Alternative.

#### Future Conditions (2020)

If none of the build alternatives is implemented, future transportation improvement projects may be undertaken by local jurisdictions in the study area to address capacity needs not being met by the proposed action. In addition, residential, commercial, and industrial development will continue in the study area regardless of whether Legacy Parkway is constructed. Although the nature and timing of such future projects are not known at this time, these projects will increase the amount of impervious area, change runoff characteristics, and potentially degrade surface water quality.

### *Build Alternatives*

Each of the proposed build alternatives would cross surface water bodies in the study area, as described in Section 4.10.2 in the Final EIS. The analysis of impacts in the Final EIS was based on information contained in two FHWA documents: *Effects of Highway Runoff on Receiving Waters* and *Sources and Migration of Highway Runoff Pollutants*. A wide range of more recent literature was reviewed to supplement and clarify water quality information for the Supplemental EIS, as described in the following sections on primary contaminants of concern. However, none of the more recent literature cited resulted in a change to the original impact conclusions for surface water quality in the Final EIS.

Impacts associated with hazardous material spills and the use of gray water for landscaping are also discussed below.

In coordination with UDEQ, the lead agencies determined that, with implementation of the proposed mitigation measures, the Legacy Parkway project would not cause water quality standards to be exceeded. These mitigation measures, which are described in detail below, include construction of vegetated filter strips, a retention pond at Center Street to prevent discharges to the Jordan River, minimization of salting to the extent practicable, and other best management practices (see *Mitigation Measures*).

#### Total Suspended Solids

As stated in the Final EIS, all proposed build alternatives would increase the amount of impervious surface in the study area and, therefore, the amount of stormwater runoff during rainstorms. This would result in an increase in sediment loads in surface waters. Construction activities could also erode soil and temporarily increase sediments in receiving waters. These conclusions have not changed since publication of the Final EIS.

### Chlorides and Total Dissolved Solids

The Final EIS states that de-icing salts could increase chlorides and TDS loading in downstream environments. Although UDOT has updated and expanded its snow removal policy to minimize the introduction of de-icing salt to the environment (see Section 4.10.2.5. above), de-icing salt would still be used on the proposed Legacy Parkway. The snow removal specifications described in the Final EIS are still current (i.e., salt would be applied at a lane rate of 57 kg per km [200 lb per mile], which would equate to 227 kg per km [800 lb per mile] for the proposed four-lane highway).

As described in the Final EIS, salt left on the road after the snow and ice have melted and evaporated would either be blown off the roadway onto the shoulder or dissolved into roadway runoff, which would be subject to stormwater treatment prior to entering adjacent streams and creeks. None of the literature reviewed quantified how much of this salt would remain on the shoulder and how much would pass into the surrounding surface waters; however, several studies provide measurements of the concentrations of chlorides and TDS found in roadside streams. Table 4.10-2 provides a representative sample of recent data on chloride and TDS concentrations in roadside streams.

The data in Table 4.10-2 indicate that chloride and TDS concentrations in direct runoff from roadways that have been de-iced can vary widely in winter months, and that chloride concentrations can be very high. However, the amount of runoff from a roadway is generally small compared to the runoff from the entire watershed of the stream.

UDEQ has determined that, other than the Jordan River (see Section 4.10.2.3, *Water Quality of Surface Conveyance*), the streams in the study area are not impaired and can still meet the standards for their beneficial use classifications if the mitigation measures proposed in this document are implemented (see *Mitigation Measures* below). Although implementation of the proposed action would further increase TDS and chloride concentrations in the affected surface water systems, the CWA Section 401 water quality certification issued to UDOT in December 2000 for Alternative D (Final EIS Preferred Alternative) states that these increases could be mitigated through specified best management practices (BMPs) (Federal Highway Administration et al. 2000).

It should be noted that, although the increase in chlorides would not affect the beneficial uses of surface waters in the study area, the increase could affect the vegetative and aquatic ecosystem. Chlorides accumulating on the roadway shoulder could kill vegetation, as disclosed in the Final EIS. Increased chloride concentrations could indirectly affect the aquatic ecosystem by causing shifts in algal communities, loss of food plants, or changes in protozoa invertebrate communities (Sorenson et al. 1996). Aquatic birds are anticipated to have a similar tolerance to salinity as domestic livestock and poultry (e.g., about 2,000 mg/L according to UDEQ standards) (Sorenson et al. 1996), and salinity at these levels would not have any adverse effects on these species.

**Table 4.10-2** Recent Data on Chloride and TDS Concentrations in Highway Runoff and Roadside Streams Compared to UDEQ Water Quality Standards

| Source of Data | Chloride Concentration | TDS Concentration |
|---|---|---|
| UDEQ Surface Water Standard (Utah Administrative Code R317-2 as in effect July 1, 2004) | | |
| Class 1 – Drinking Water | No standard | No standard |
| Utah's Secondary Drinking Water Standards (aesthetic standard) | 250 mg/L | 500 mg/L |
| Class 2 – Recreation | No standard | No standard |
| Class 3 – Aquatic Wildlife | No standard | No standard |
| Class 4 – Agriculture | No standard | 1,200 mg/L |
| Runoff directly from Roadways (Federal Highway Administration 1996) | | Average: 356 mg/L |
| St. Johnsbury, Vermont | | |
| Stream adjacent to three-lane highway (Sorenson et al. 1996) | Maximum: 100 mg/L<br>Mean: less than 50 mg/L | |
| California | | |
| Streams downstream of I-180 (Sorenson et al. 1996) | Mean: 22mg/L | |
| | Maximum: 121 mg/L | |
| Runoff from I-80 (Sorenson et al. 1996) | Average: 270 mg/L | |
| Jamesville, New York | | |
| Rural streams downstream of U.S. Hwy 20 (Sorenson et al. 1996) | Range: 10 to 235 mg/L | |
| Runoff directly from Hwy 20 (Sorenson et al. 1996) | Range: 20 to 5,500 mg/L | |
| Cincinnati, Ohio | | |
| Runoff from roadway (Sansalone et al. 1998) | | Range: 21.8 to 333.2 mg/L<br>Number of events: 13<br>Mean: 158.4 mg/L<br>Standard deviation: 110.8 |
| Snow from roadside (Sansalone and Buchberger 1999) | | Range: 50 to 200 mg/L |
| Residential Road I-75 | | Range: 0 to 2,200 mg/L |

## Metals

As described in the Final EIS, FHWA's numerical water quality model was used to quantify the impacts on surface waters from metals in the runoff associated with the proposed build alternatives. Copper, lead, and zinc were selected as the specific metal contaminants of concern for analysis based on the availability of the required data. Table 4.16 in the Final EIS lists the EPA acute criterion that was used at the time the Final EIS was published. The current UDEQ numeric water quality criteria are 13 micrograms per liter for copper and 65 micrograms per liter for lead. There has been no change to the zinc standard (Utah

Administrative Code, R317-2-14). The data collected from the model show that the one-time-every-3-year concentration of these metals would not exceed the updated acute criteria. No new methodologies for quantitatively modeling impacts on surface water from roadways have been developed since publication of the Final EIS. Further, EPA's STORET database did not have any new water quality data that could be used to update the modeling results (U.S. Environmental Protection Agency 2003c), and UDEQ did not have concerns regarding possible exceedences of the revised metals standards.

### Hazardous Material Spills

As described in the Final EIS, a hazardous material spill could affect surface water quality under the No-Build Alternative or any proposed build alternative. An estimated five incidents involving hazardous materials could occur on the proposed highway or roads accessing the highway per year, based on existing I-15 data.[2] Impacts associated with hazardous material spills are difficult to quantify because their location, severity, and conditions are not known in advance; however, immediate action by the party responsible and spill response teams would minimize adverse impacts.

### Use of Gray Water for Landscaping

The use of gray water to maintain landscaping in the proposed build alignments would minimize the use of treated tap water. If the gray water were not treated sufficiently, however, it could contribute contaminants to soil and water. Although UDOT has not decided whether to use gray water in the project area, any gray water would be used only with UDEQ's approval and in accordance with wastewater treatment and water quality regulations that would significantly minimize the possibility of such contamination.

## *Mitigation Measures*

As stated in the Final EIS, mitigation measures for minimizing impacts on the quality of surface water resulting from implementation of the build alternatives were developed in coordination with the Corps, UDEQ, and UDOT. Information relative to the mitigation measures identified in the Final EIS has been updated and is summarized below.

The Final EIS states that stormwater would be concentrated (i.e., routed to a ditch or a pipe) only where necessary (e.g., drainage from the overpasses). This concentrated stormwater would not be discharged directly into surface water bodies but would be routed over the vegetated filter strips (see below), or dissipated back to sheetflow. The vegetated filter strips would reduce flow, capture contaminants, and minimize discharges by allowing some volume of water to percolate into the ground as it traverses the vegetated strips. Water that does not percolate into the soil would either sheetflow off the right-of-way or drain into a culvert that carriers surface water under the roadway. No additional stormwater pipes are proposed other than those associated with surface water conveyance and/or floodplain equalization. The individual components of this mitigation are described in the following subsections.

[2] This estimate was used in Section 4.3.4 of the Final EIS and was projected by analyzing 8 years of data between 1991 and 1998 on incidents occurring on I-15 that were reported to the UDEQ Division of Environmental Response and Remediation.

### Minimization of Salting

UDOT would minimize salting on the roadway to the extent practicable.

### Retention Pond

UDOT would construct a retention pond near Center Street to retain sufficient runoff from a 100 year-storm to prevent discharge to the Jordan River.

### Minimization of Concentrated Discharges

As described in the Final EIS, all the proposed build alternatives would be constructed without curbs to allow stormwater runoff to sheetflow off the highway. This mitigation measure has not changed since publication of the Final EIS.

### Vegetated Filter Strips

As described in the Final EIS, road design would include vegetated filter strips to improve the quality of runoff from the highway, as recommended by the Corps and UDEQ. In response to the remand of the U.S. Court of Appeals for the Tenth Circuit since publication of the Final EIS, documentation has been compiled on the effectiveness of the vegetated filter strips in removing TSS and other contaminants from highway runoff. This information is presented in the right-of-way technical memorandum (HDR Engineering 2005a), and in Section 2.1 of this document. The technical memorandum states, in summary, that vegetated filter strips would be more effective and would mimic existing hydrologic patterns more closely than other means of water treatment (e.g., detention basins). The location of the proposed vegetated filter strips are illustrated in the typical cross section figures presented in Chapter 3, *Alternatives*, of this document. It should be noted that the narrower right-of-way would not affect the ability of the vegetated filter strips to treat water quality to the standards required in the CWA Section 401 water quality certification (see the right-of-way technical memorandum [HDR Engineering 2005a]).

### Floodplain Equalization Culverts, Surface Water Conveyances, and Groundwater Conveyances

The Final EIS states that equalization culverts would be installed to maintain sheetflow conditions across the study area to the extent practical. This mitigation measure was proposed to limit concentrated discharges and reduce erosion and impacts on water quality. Equalization culverts would be designed to limit culvert discharges to less than 0.14 cubic meters (5 cubic feet) per second. In addition, for costing purposes, the Final EIS stated that equalization culverts would be positioned every 150 m (492 ft) to maintain sheetflow conditions in the study area.

The Final EIS also states that equalization culverts would be used to mitigate impacts on wetland hydrology (e.g., to allow free movement of water in either direction and to minimize concentrated discharges) and floodplains (e.g., to allow floodwater to pass back and forth beneath the roadway to preserve the natural and beneficial floodplain.).

The conveyance structures that would be used to minimize impacts on water quality in the study area are described further in the following subsections. The equalization culverts described in the Final EIS and above are identified in the Supplemental EIS as surface water conveyances (designed to allow the free movement of water, maintain sheetflow conditions outside the Corps floodplain boundary, and minimize concentrated discharges to wetlands) and floodplain equalization culverts (designed to maintain flows within the Corps floodplain boundary). Groundwater conveyance structures are also described below to indicate how potential impacts on groundwater flows and therefore groundwater slope and depressional wetlands would be mitigated.

Figure 4.10-4 graphically depicts how surface water and groundwater would be conveyed in and around the roadway, as described below. The floodplain equalization culverts are depicted in Figure 4.14-2 of this document.

#### *Surface Water Conveyances*

Surface water conveyance structures would be used to allow free movement of water in either direction, maintain sheetflow conditions to the extent practical, and minimize concentrated discharges to waterways and wetlands in the study area. Although the Final EIS may have implied that surface water conveyances would be installed at regular intervals along the project alignment, surface water conveyances would actually be installed in areas where an existing hydrologic connection would be cut off by the proposed highway. The surface water conveyances would be designed to pass surface water through the road in the direction or directions of its existing flow. The conveyances could be manifest as many types of drainage structures, including culverts, series of small culverts, French drains, corrugated strip drains, synthetic drainage nets, and gravel layers.

The mechanism used for surface water conveyance is shown in Figure 4.10-4.

#### *Floodplain Equalization Culverts*

Based on more specific hydraulic design information obtained during the design-build process, UDOT and the Corps have determined that equalization culverts for the purpose of equalizing floodwaters across the road would be needed only within the Corps floodplain boundary rather than along the entire length of the proposed roadway as is described in the Final EIS (Parker pers. comm.[a]). These floodplain equalization culverts depicted and discussed in Section 4.14, *Floodplains*, of this document.

#### *Groundwater Conveyances*

Groundwater conveyance structures would be installed to mitigate the potential impact of the road embankment consolidating underlying soils and impeding groundwater flows. Groundwater conveyances would be installed in areas where fill heights exceed approximately 3 m (10 ft), and would extend from the eastern fill limit to the western fill limit. UDOT would also monitor groundwater levels during construction.

#### Scour and Erosion Protection

As described in the Final EIS, scour protection to mitigate downstream erosion will be provided at all culvert outlets and stream crossings, if warranted. This mitigation measure has not changed since publication of the Final EIS.

## 4.10.3.3 Groundwater Quality

### *No-Build Alternative*

#### Existing Conditions (2004)

No project-related impacts on ground water quality would occur under the existing conditions (2004) No-Build Alternative.

### Future Conditions (2020)

In none of the build alternatives is implemented, recent conditions and trends in the quality of groundwater will likely continue. In the shallow aquifer, the chemistry of the groundwater will continue to vary considerably, based on location and future adjacent land use. In the deeper principal aquifer, sodium and chloride levels will likely continue to increase, particularly given that historical increases have been attributed in part to increased urban development and population growth in the Salt lake Valley. The extent and nature of these changes are not known at this time.

## *Build Alternatives*

As described in the Final EIS, certain pollutants (i.e., chlorides, TDS) could be generated during construction or operation of any proposed build alternative, which could affect the water quality of the shallow aquifer in the study area. The Final EIS stated that chloride concentrations in the shallow aquifer are already high but did not specifically state that TDS concentrations were also high (i.e., as much as 20,300 mg/L in the northwestern part of the Salt Lake Valley near the study area [see Section 3.10.4 in the Final EIS]). As illustrated in Table 4.10-2 above, TDS in highway runoff does not typically exceed 2,200 mg/L, and is usually much less. Given the existing high concentrations of TDS and chlorides in the shallow aquifer, the representative TDS and chloride concentration information presented in Table 4.10-2, and the relatively small surface area affected by the road compared to the overall extent of the aquifer, it is unlikely that the proposed build alternatives would adversely affect the water quality of the shallow aquifer in the study area.

Similarly, as stated in the Final EIS, the deeper principal aquifer is separated from the shallow upper aquifer by a layer of fine-grained soil. This barrier, and the fact that the deeper aquifer has an upward gradient, makes it unlikely that surface runoff could infiltrate the principal aquifer and affect the water quality.

### Hazardous Waste Spills

As described in the Final EIS, an accidental spill of a large quantity of hazardous material could affect groundwater quality in the study area if it not immediately contained and cleaned up. Containment and cleanup would be facilitated by the flat terrain and vegetation on the right-of-way.

# 4.10.3.4 Groundwater Rights and Wells

## *No-Build Alternative*

### Existing Conditions (2004)

No project-related impacts on groundwater rights and wells would occur under the existing conditions (2004) No-Build Alternative.

### Future Conditions (2020)

In none of the build alternatives is implemented, ground water rights and wells in the study area may be affected by future development, although the nature and timing of any such impacts are not known at this time.

### *Build Alternatives*

#### Wells

As described in Section 4.10.2.5 above, UDNR's Water Rights Division tracks groundwater rights by inventoried water right numbers, each of which can include one or more groundwater wells. All water rights and their associated wells that fall within the rights-of-way of the proposed build alternatives are shown in Figure 4.10-5, which updates Figure 4-13 in the Final EIS. Wells located in the right-of-way of a build alternative would be affected by implementation of that build alternative because the owner of the well would not be able to maintain ownership.

The number of wells that would be located in the right-of-way of each build alternative is indicated in Table 4.10-3, which updates Table 4-17 in the Final EIS. These numbers are smaller than those presented in the Final EIS because the right-of-way associated with each build alternative has been narrowed from 100 m (328 ft) to 95 m (312 ft) (see Chapter 3, *Alternatives*).

As stated in the Final EIS, runoff from Legacy parkway could not affect wells located upgradient (east) of the highway and outside of the proposed rights-of-way. In addition, it is unlikely that highway runoff would have any impact on wells located outside the proposed rights-of-way on the downgradient (west) side of the highway.

**Table 4.10-3** Affected Groundwater Right[1]

| Water Right Classification | Alternative A | Alternative B | Alternative C | Alternative D | Alternative E |
|---|---|---|---|---|---|
| Groundwater Rights within Proposed Rights-of-Way | | | | | |
| Domestic | 15 | 15 | 8 | 8 | 8 |
| Irrigation | 39 | 44 | 34 | 38 | 35 |
| Stock Watering | 39 | 45 | 41 | 34 | 32 |
| Municipal | 2 | 2 | 2 | 2 | 2 |
| Other[2] | 3 | 3 | 3 | 3 | 4 |
| Total[3] | 65 | 69 | 49 | 56 | 53 |

Notes:

1 *Affected groundwater rights* represents groundwater rights located within a build alternative right-of-way.

2 Other constitutes a range of uses not classified above, such as cooling, recreational, or industrial.

3 The totals shown in the table are different than the actual number of water rights in the study area because some water rights have more than one classification and some have no classification. Additional groundwater and surface water rights may be acquired to provide water to the proposed Legacy nature Preserve. As of June 2004, UDOT has acquired surface water rights from North Canyon Creek and the Jordan River.

Source: UDNR Division of Water Rights 2005

#### Drinking Water Protection Zones

As described in Section 4.10.2.5 above, UDEQ now refers to wellhead protection areas as DWSP zones. Since publication of the Final EIS, owners of public drinking water sources have delineated DWSP zones and submitted DWSP plans to UDEQ, Division of Drinking Water. Development is not allowed within DWSP zones unless the development is consistent with the DWSP plan. Alternatives A, D, and E are located within a DWSP zone (Zone 4) for a public well owned by the City of Woods Cross. The City of Woods Cross has stated, however, that the proposed action would be consistent with its DWSP plan for this well (St. Jeor pers. comm.). Weber Basin Conservancy District also owns a DWSP zone located in the study area near Farmington. This well is not in use, however, and would not be affected by any proposed build alternative.

### *Mitigation Measures*

As stated in the Final EIS, for wells located in the right-of-way of a build alternative, UDOT would either purchase the groundwater right from the owner or pay for a transfer of the right.

## 4.10.3.5 Biogeochemical Functions of Wetlands

As stated in the Final EIS, potential impacts on wetland biogeochemical functions were assessed using the Legacy Parkway wetland functional assessment model and quantified in functional capacity units (FCUs). See Section 4.12 of the Final EIS and Section 4.12, *Wetlands*, of this document for a detailed discussion of the results.